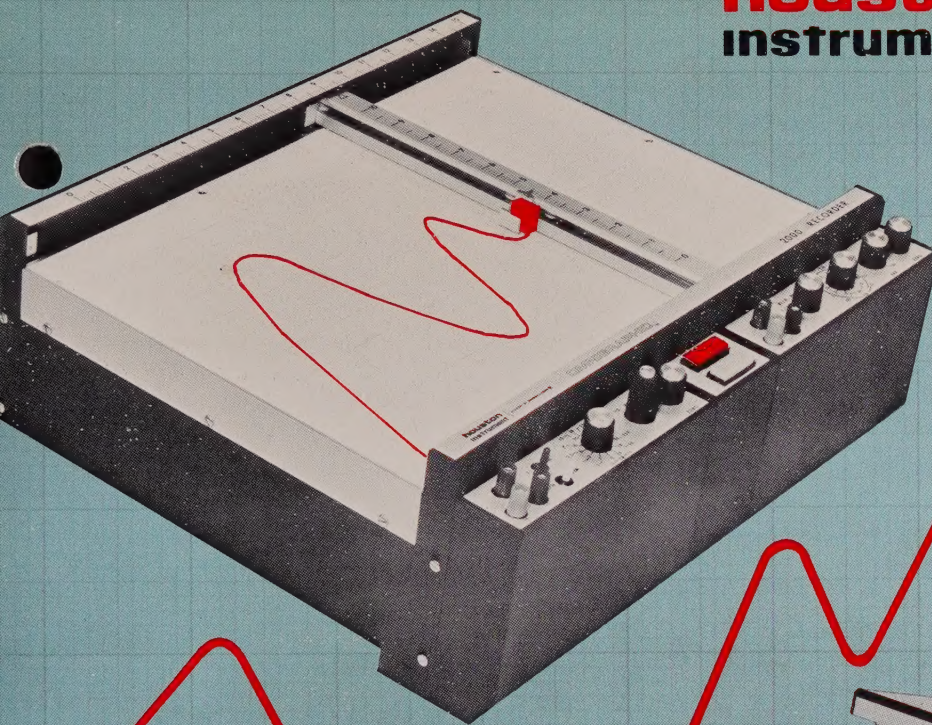
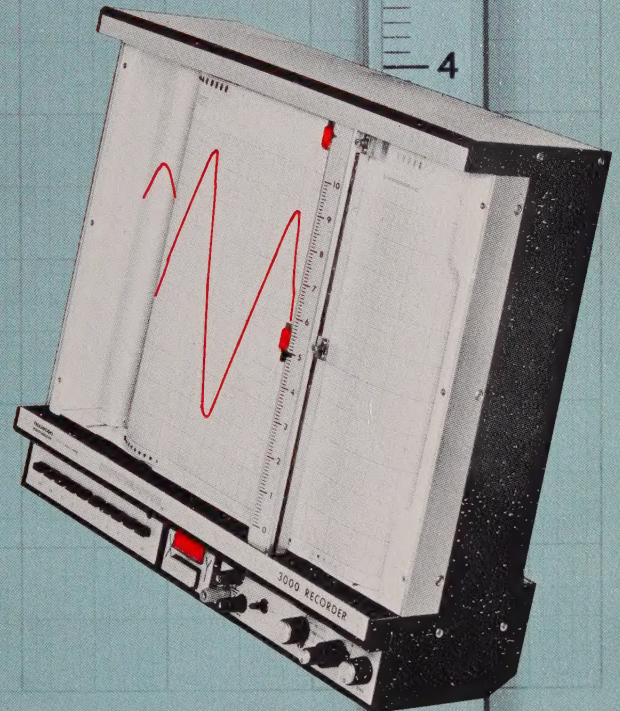


**houston**  
instrument

DIVISION OF BAUSCH & LOMB

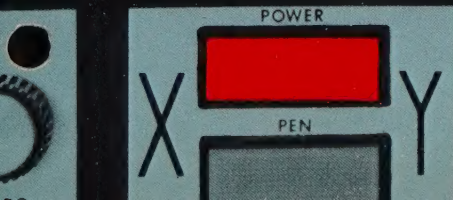


# SERIES 2000 & 3000 RECORDERS



OMNIGRAPHIC®

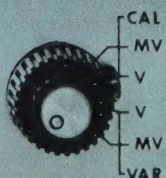
2000 RECORDER



Type 7



IN CM



## OUTSTANDING FEATURES

### 2000 X-Y 3000 STRIP CHART

**DIFFERENTIAL INPUT:** Measures from any type of source up to  $\pm 500$  volts from ground. Isolation and common mode rejection are so good that shields and guards are not needed.

**MOUNTING:** Bench, Rack or Panel in vertical or horizontal planes.

**ZERO CHECK POSITION:** A standard feature on most modules. Without disconnecting the signal, zero position can be verified and scaled.

**ALL SOLID STATE:** State of the art IC's. No mechanical or light diode choppers. No tubes or nuvistors. No warm-up for calibrated operation.

**CONSTRUCTION:** Case and modules are unbreakable, mar resistant ABS black plastic, with a textured surface. This instrument will look new for years. It is not susceptible to nicks and scratches. Interior frame is injection cast aluminum. All other parts are plastic, stainless steel or anodized aluminum.

**WEAR COMPENSATING MECHANISM:** State of the art design eliminates adjustment. Cleanliness is desired, but not essential. No lubrication ever.

**INCH/CENTIMETER SCALING:** Front panel switch, on modules, allows calibration of recorder in inches or centimeters, as related to the paper grid.

**ACCESS:** Sides, bottom and top are removable in seconds for complete access to any portion — either individually or completely.

**PEN LIFT:** Electric with positive action. Failsafe on power failures. Local and remote control via isolated contact closure.

**PENS:** A constant line trace regardless of speed or use. Snap on, disposable unit includes pen tip and ink. No need ever for complicated cleaning procedures or overnight plugging. Pens will write after weeks unused. Capillary ink pen option.

**OVERSHOOT:** Not discernible on normal step inputs. Less than 1% on full scale step inputs.

**HIGH PERMISSIBLE SOURCE RESISTANCE:** As sources approach and exceed the  $10^5$  ohms domain, neither dead zone nor repeatability is affected; common mode and frequency response only mildly; calibration normally.

**VERSATILITY:** Laboratory or field, production or process, OEM or dedicated — all are ideal for this recorder. The completely self contained frame stands alone, but can act as the basic building block for the modules. There is no duplication in circuitry. The design is so basic that no part contains a premium capability.

**SEALED REBALANCE POTENTIOMETERS:** No cleaning ever, with extended life. Recorder uses its own limit stops and a friction clutch to give added protection to the pot and the entire mechanics.

**INPUT MODULES:** Plug-in modules give choice of function and cost. Each gives front panel and remote control. All units plug-in and are interchangeable in moments. Most modules even work in the related X-Y, Strip Chart, and TY® Recorders.

**MODULE CONTROLS:** Logically placed for unthinking use. Each control is always in the same place, regardless of module type.

**DYNAMIC PERFORMANCE:** Less than 1/3 second full scale with extremely high acceleration. Add critical damping and the recorder has unbeaten recording fidelity.

**ACCURACY:** Conservatively rated at  $\pm 0.2\%$  overall inaccuracy, the typical recorder has linearity, calibrated errors and dead zones less than the trace width.

**NOISE REJECTION:** Unexcelled for common and normal mode rejection. Acute care in the layout and individual testing, combines with the differential nature to increase rejection by orders over conventional units.

**ENVIRONMENTAL:** Completely unaffected by wide variations in temperature, humidity, line voltage, or frequency.

**MODULAR CONSTRUCTION:** Amplifier, drive assemblies, and of course modules, are individually removable. They may be swapped with the complementary lines of X-Y, Strip Chart, and TY® Recorders.

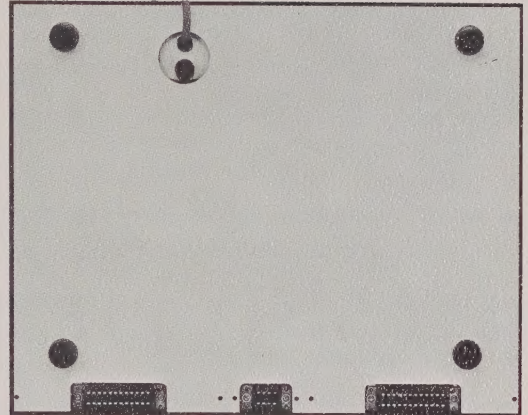
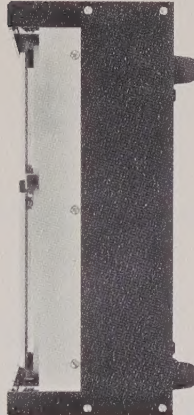
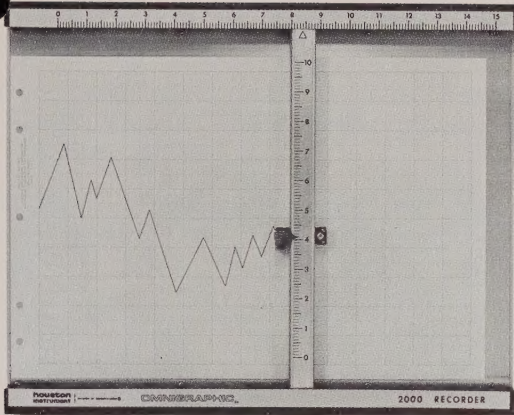
**PAPER SIZE:** Recorder will handle both 8-1/2 x 11 and 11 x 17 inch paper sizes, along with European types A4 and A3. With the inch/centimeter flexibility, the recorder is universal the world over — independent of discipline or national origin.

**VACUUM HOLDDOWN:** Silent retention of the paper. Unaffected by dust, temperature, humidity, line frequency or voltage. Contaminants pass thru the impeller turbine system which grips from mass air flow rather than  $\Delta P$ . Maintenance free with no shock hazard.

**INTERCHANGEABLE AMPLIFIERS:** Each axis has a completely independent servo mounted on its own plug-in circuit board. They may be swapped or even used in the complementary line of strip and T-Y® Recorders.

**X-Y CONFORMITY:** Acceleration, slewing speed, phasing and damping of X and Y axis drives in 2000 series recorders are matched for minimum error under dynamic conditions. Essential in analyzer, calculator, computer readout applications.

## THE MAINFRAME



From any angle:

- Mechanical
- Electrical
- Price
- Flexibility

UNBEATABLE

The mainframe is a complete working recorder without front panel controls. All inputs are via individual rear input connectors. Power and pen control, using contact closures, are via a separate rear connector. Input resistance is potentiometric with no less than 2 megohm slewing resistance. Zero is fixed or can be remotely controlled by running three shielded wires to an external 5K pot.

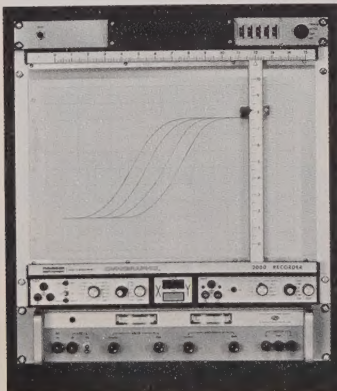
Power may be either 115 or 230 volt A. C. and is field convertible from one to the other. Case is mar resistant and unbreakable plastic, with a textured black finish. Bottom, sides and top are separately removable, involving only a total of eight screws. Total exposure is a minute's work. Sub-assemblies are all modular and field replaceable as units. Amplifiers are separate and interchangeable.

Standard accessories include five pens each of red and blue,

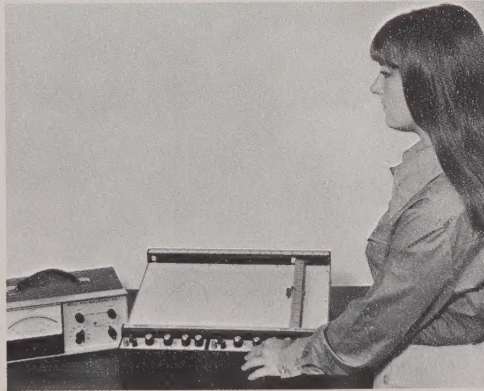
instruction manual, plastic dust cover, spare fuse and cable, and Bristol wrenches. All are shipped in a specially molded styrofoam case.

As a stand-alone unit, the mainframe is ideal for dedicated applications, where operational controls are better suited with the primary measurement or instrument controls, and most certainly as an OEM recorder. It offers the advantages of later expansion by addition of modules — without modification, and at any time.

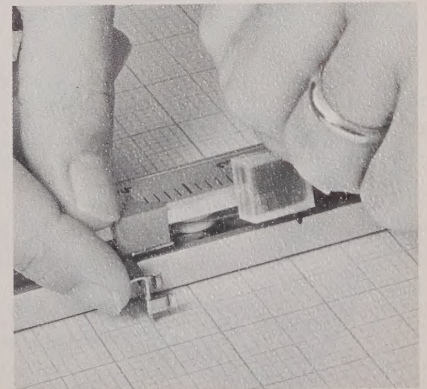
And most certainly, the mainframe acts as the basic building block for general purpose recording by adding input and control modules. The same remote connectors mate directly into the plug-in modules, giving front panel control with wide variety.



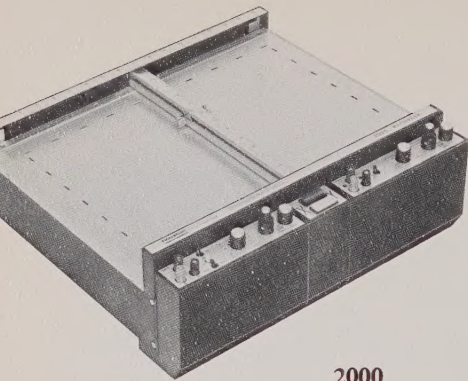
Rack



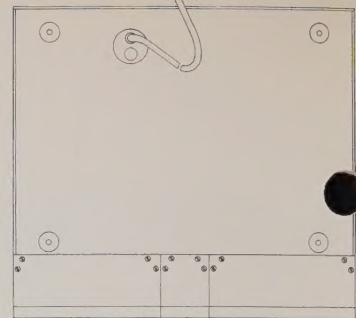
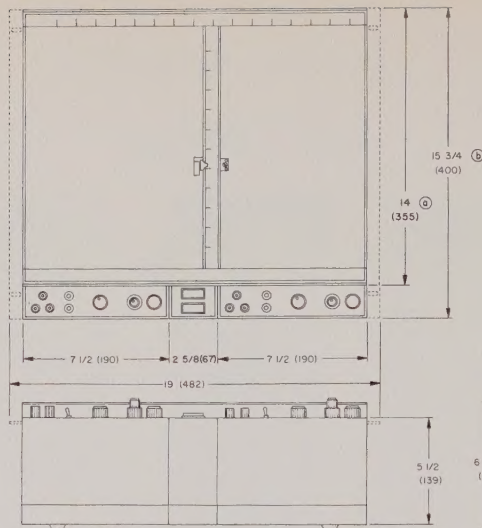
Bench



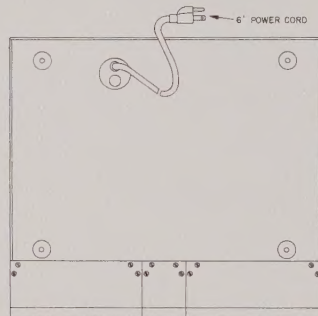
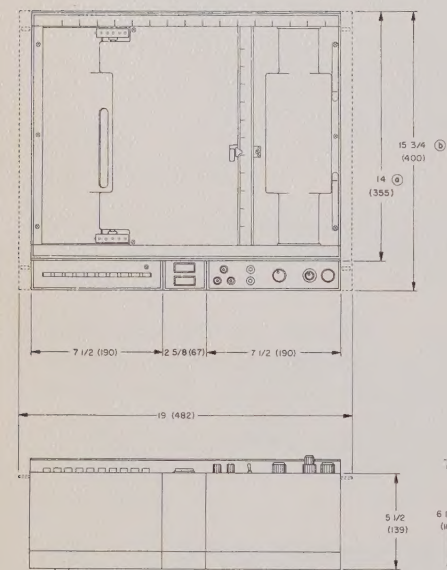
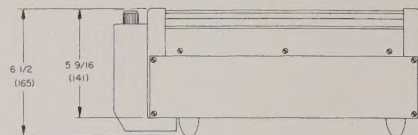
Pens Are Disposable and Snap on



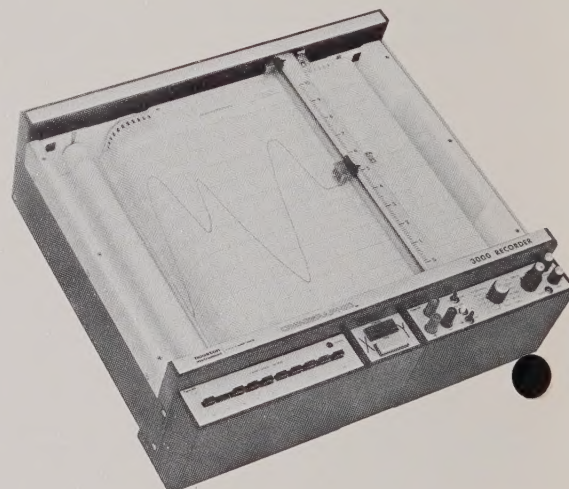
2000



ALL DIMENSIONS IN INCHES AND (MILLIMETERS)

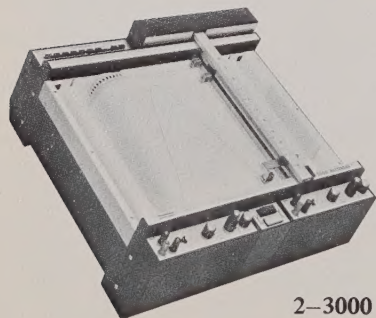
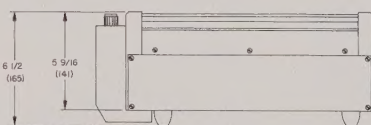


ALL DIMENSIONS IN INCHES AND (MILLIMETERS)

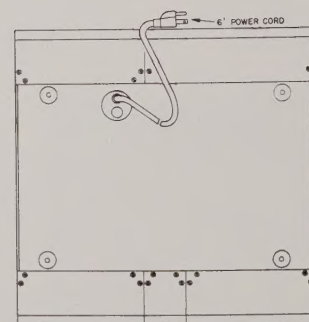
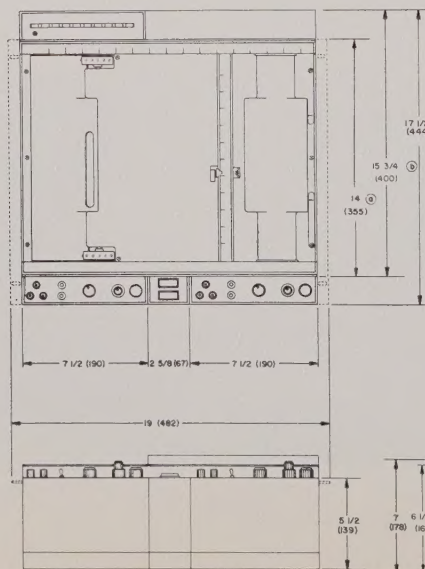


3000

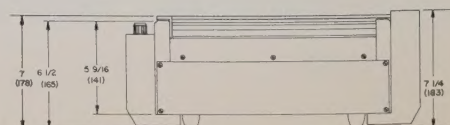
NOTE:  
 (a) WITHOUT MODULE  
 (b) WITH MODULE



2-3000



ALL DIMENSIONS IN INCHES AND (MILLIMETERS)



## MAINFRAME SPECIFICATIONS

### X and Y AXES — 2000 X-Y RECORDER Y AXIS — 3000 STRIP CHART RECORDER Y1 and Y2 AXES — 2-3000 STRIP CHART RECORDER

**RECORDING MECHANISM:** Potentiometric servo with sealed rebalance potentiometer. Long life, snap-in, disposable pen.

**RESPONSE TIME:** 1/3 second full scale maximum independent of line voltage or frequency. Optional — 1/4 second.

**ACCELERATION:** > 1500 in/sec<sup>2</sup> (3750 cm/sec<sup>2</sup>) on 1/3 second instrument; > 1800 in/sec<sup>2</sup> (4500 cm/sec<sup>2</sup>) on 1/4 second instrument.

**OVERSHOOT:** Critical damping. Less than 1% overshoot on full scale steps; overshoot is not discernible on half scale or less steps.

**ACCURACY:** ±0.2% of full scale.

**LINEARITY:** ±0.1% of full scale.

**REPEATABILITY:** ±0.1% of full scale.

**RESETABILITY:** ±0.05% of full scale.

**INPUT CHARACTERISTICS:** Differential and floating to ±500 VDC or peak AC above ground.

**INPUT RESISTANCE:** Potentiometric; modulator input is shunted by 0.1 microfarad capacitor.

**SENSITIVITY:** Basic sensitivity of 1 mv/inch (0.5 mv/cm) is set by external gain control resistors.

**STANDARDIZATION:** Continuous double regulated zener with temperature compensation (±0.0025%/°C).

**COMMON MODE REJECTION:** On most sensitive range; 140 db at DC; 140 db at line frequency with up to 1K source resistance. Decreases 20 db per decade of attenuation for both AC and DC.

### CHART AXIS 3000 and 2-3000 STRIP CHART RECORDER

**CHARTS:** 100 foot chart rolls, 12 inches wide with 10 inches or 250 mm writing width.

**CHART FEED:** Roll take up or positive paper feed, depending on operator choice.

**CHART DRIVE MECHANISM:** Stepper motor, unidirectional drive.

**CHART SPEED:** Proportional to chart drive pulse rate to 40 inches/minute at 360 pulses/inch chart motion, (300 pulses/inch in 50 Hz recorder).

**DRIVE PULSE REQUIREMENTS:** +5 to +50 volts into 10K ohms, D.C. coupled. Maximum pulse rate is 200 per second. Pulse rise, on, and off times are not critical, but the pulses should be at least 10 microseconds wide.

**EVENT MARKER:** Single event marker is actuated by closure of a pair of contacts. Contacts make and break 12 volt, 0.5 amp inductive circuit.

## GENERAL SPECIFICATIONS

**PEN UP/DOWN:** Closure of a pair of contacts lowers recording pen; opening the contacts raises pen. Contacts make and break 12 volt, 0.5 amp inductive circuit.

**MOUNTING:** Bench, rack, or panel. May be mounted at any angle to 90° any axis.

**WEIGHT:** With modules, 30 lbs. (13.5 Kg); shipping 34 lbs. (15.3 Kg). Mainframe only 26 lbs. (11.7 Kg).

**ENVIRONMENTAL:** 0 to 40°C operating. -10 to 60°C storage; 0-95% relative humidity at 30°C dry bulb.

**POWER:** 2000 X-Y Recorder — 115/230 VAC; 50-60 Hz; 60 volt amperes.  
3000 and 2-3000 Strip Chart Recorders — 115/230 VAC; 50 or 60 Hz; 50 volt amperes. If Type 50 or 52 Time Base module is to be used and line frequency is 50 Hz, the recorder must be ordered for 50 Hz. operation.

**TERMINAL BOXES:** For O.E.M. and dedicated use. Where the various functional modules are not used the recorder is shipped with terminal boxes. These are installed in the module connectors on the underside of the recorder. Signal and control input circuits in the recorder are accessed via barrier strips installed in the terminal boxes. Consult Houston Instrument or its representative for additional details concerning O.E.M. applications.

## PRICES

(Include terminal boxes, if installed)

|                                                 |           |
|-------------------------------------------------|-----------|
| Model 2000 X-Y Recorder . . . . .               | \$ 770.00 |
| Model 3000 Strip Chart Recorder . . . . .       | 710.00    |
| Model 2-3000 Two Pen Strip Chart Recorder . . . | 1080.00   |
| Rack Mounting Wings . . . . .                   | 8.00      |

### OPTIONS:

|                                             |           |
|---------------------------------------------|-----------|
| 40 inch/second Servo                        |           |
| 2000 (Both axes only) . . . . .             | 200.00    |
| 3000 . . . . .                              | 100.00    |
| 2-3000 (Both axes only) . . . . .           | 200.00    |
| Retransmit Potentiometer                    |           |
| 2000 Per axis . . . . .                     | 50.00     |
| 3000 Y axis only . . . . .                  | 50.00     |
| 2-3000 Y1 axis only . . . . .               | 50.00     |
| High-Low Limit Switches —Per axis . . . . . | 75.00     |
| 115/230 VAC, 50 Hz. mains operation . . .   | No Charge |

## MODULES

Plug-in modules vastly expand the uses of the recorder mainframe. Modules provide front panel signal, power and pen controls for general purpose recording. In general, each is self contained and plugs directly into the recorder.

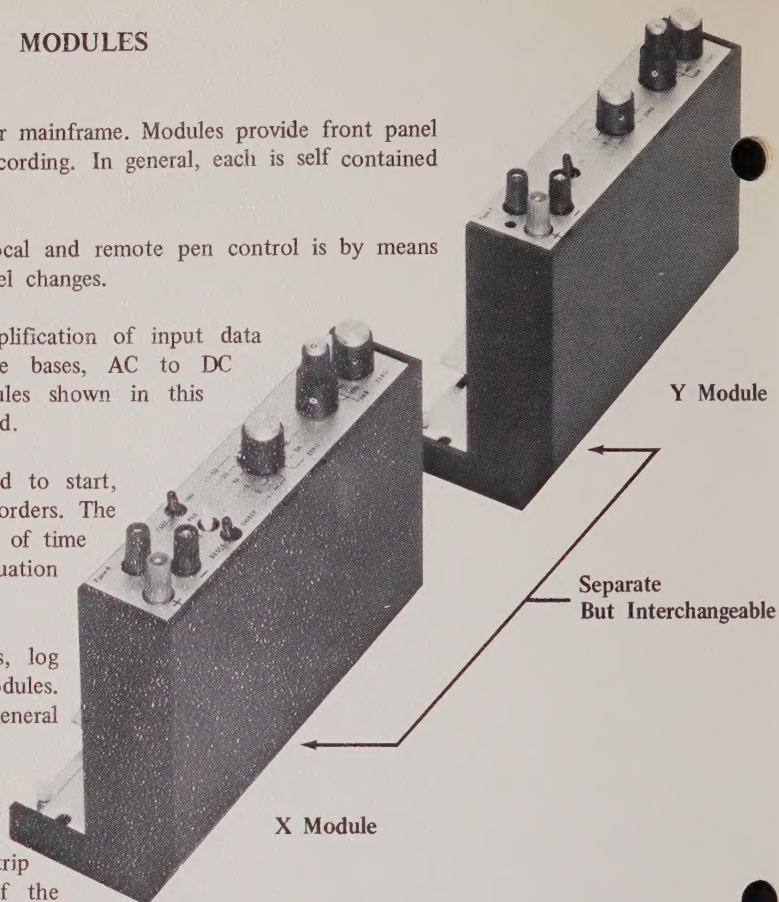
Control modules control line power, pen up/down. Local and remote pen control is by means of switch contact operation or, optionally, by logic level changes.

Signal module functions include attenuation and amplification of input data signals, generation of linear voltage ramps for time bases, AC to DC conversion. In addition to the standard signal modules shown in this brochure dozens of special modules have been developed.

Time base and chart drive control modules are used to start, stop, and control the chart speed of strip chart recorders. The event marker pushbutton is located on the front panel of time base modules. Remote start/stop and event marker actuation is accomplished by operation of switch contacts.

Point plotters, integrators, thermocouple compensators, log voltage amplifiers are examples of special function modules. In general these modules are interchangeable with general purpose plug-ins.

Most signal modules have universal five way binding post or BNC connectors on the front panel. All control, signal, and time base modules have barrier strip access to control and signal inputs at the rear of the modules. Signal and control cabling may be concealed by routing to the barrier strip along the underside of the recorder.



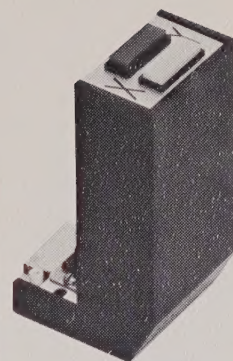
## A BRIEF GUIDE TO MODULES

| TYPE  | DESCRIPTION                    | PURPOSE                                   | USE WITH |      |        |
|-------|--------------------------------|-------------------------------------------|----------|------|--------|
|       |                                |                                           | 2000     | 3000 | 2-3000 |
| 0     | Customizing                    | "Do it yourself" — Signal Axis            | *        | *    | *      |
| 00    | Customizing                    | "Do it yourself" — Time Axis              | *        | *    | *      |
| 1     | DC Coupler                     | Dedicated; OEM                            | *        | *    | *      |
| 2     | Ranging                        | Economy Variable Range                    | *        | *    | *      |
| 3     | Switching                      | Economy Switched Attenuator               | *        | *    | *      |
| 4     | Switching/Time Base            | Economy Switched Attenuator and Time Base | *        | *    | *      |
| 5     | Precision Attenuator           | 14 Calibrated Ranges                      | *        | *    | *      |
| 6     | Precision Attenuator/Time Base | 14 Calibrated Ranges and Sweeps           | *        | *    | *      |
| 7     | Preamp/Attenuator              | 17 Ranges from 100 mv/inch                | *        | *    | *      |
| 8     | Preamp/Attenuator/Time Base    | 17 Ranges from 100 mv/inch and 18 Sweeps  | *        | *    | *      |
| 9     | Precision Ranging              | For Wide Range Precision                  | *        | *    | *      |
| 10    | High Sensitivity AC            | 100 mv to 50 v/inch; AC only              | *        | *    | *      |
| 11    | Preamp; Fixed Span             | 100 mv/inch DC                            | *        | *    | *      |
| 12    | Precision Attenuator/Offset    | Up to 100:1 Offset                        | *        | *    | *      |
| 13    | Integrator                     | Record Amplitude — Time Integral          | *        | *    | *      |
| 14    | Log Converter                  | 1—2—3 Decade Log Amplifier                | *        | *    | *      |
| 15    | Two Channel Switching          | Multiplex Two DC Signals                  | *        | *    | *      |
| 16/17 | Point Plotter                  | Analyzer/Computer Readout                 | *        | *    | *      |
| 18    | Thermocouple Reference         | Terminate JKS Thermocouples               | *        | *    | *      |
| 20    | AC/DC Switching                | General Purpose AC and DC                 | *        | *    | *      |
| 26/17 | Point Plotter                  | Analyzer/Computer Readout                 | *        | *    | *      |

## CONTROL MODULES

Lighted pushbuttons control AC power and pen up/down. Rear terminals allow remote control by switch contact operation. Required when signal or time base modules are used.

| TYPE | DESCRIPTION                                     | USE WITH |      |        | PRICE   |
|------|-------------------------------------------------|----------|------|--------|---------|
|      |                                                 | 2000     | 3000 | 2-3000 |         |
| 100  | Power On/Off: Logic Level Remote Pen Control    | *        | *    |        | \$50.00 |
| 200  | Power On/Off: Switch Contact Remote Pen Control | *        | *    |        | 25.00   |
| 300  | Same As Type 200; Legend for 2 Pen Recorder     |          |      | *      | 25.00   |
| 400  | Same As Type 100; Legend for 2 Pen Recorder     |          |      | *      | 50.00   |



## TIME BASE MODULES

Pushbutton selection of nine chart speeds and actuation of event marker. Chart speed is referenced to line frequency, to internal stable oscillator, or external pulse train.

**CHART SPEEDS:** In standard 3000 main frame:

Inches: .05, 0.1, 0.2, 0.5, 1, 2, 5, 10, 20 inches/minute.  
Centimeters: 0.1, 0.2, 0.4, 1, 2, 4, 10, 20, 40 cm/minute.

### CHART SPEED ACCURACY:

Line frequency reference: Dependent on accuracy of line frequency.

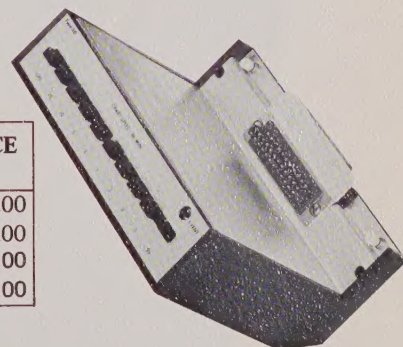
Internal frequency reference: 0.1% of selected speed.

### EXTERNAL PULSE INPUT:

0 to +5 volts or greater into 10K ohms. D.C. coupled, >10 $\mu$ seconds duration, 200/second maximum.

## SELECTION CHART

| TYPE | CHART SPEED UNITS |        | REFERENCE FREQUENCY |          | USE WITH |        | PRICE    |
|------|-------------------|--------|---------------------|----------|----------|--------|----------|
|      | IN/MIN            | CM/MIN | LINE                | INTERNAL | 3000     | 2-3000 |          |
| 50   | *                 |        | *                   |          | *        |        | \$100.00 |
| 52   | *                 |        | *                   |          |          | *      | 100.00   |
| 54   | *                 | *      |                     | *        | *        |        | 135.00   |
| 55   | *                 | *      |                     | *        |          | *      | 135.00   |

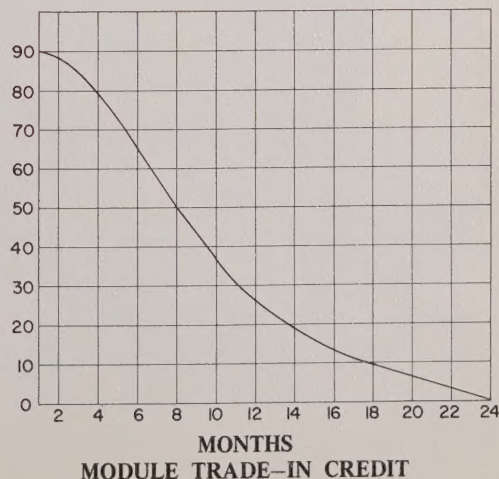


**TRADE-IN POLICY:** Inevitably, a new need is found for the recorder. And very possibly a different module best suits the new application. In study of the modules, one notes that each offers somewhat more than the predecessor. Effectively, a new module could obsolete the old unit. Houston abhors the shelves full of dust gathering modules created by some instruments. Only the most flexible units are desired - the others sit. Our wide selection of modules could create an identical situation.

A simple trade-in policy banishes this ill. Credit against a new module purchase is allowed on the old unit. Credit is proportionate to age - not use, other than normal wear and tear.

So purchase originally only that needed. Then later upgrade at a minimal premium. And never put one aside - trade it in.

% CREDIT



## OMNIGRAPHIC® 3000 STRIP CHART RECORDERS

### ADVANTAGES OVER CONVENTIONAL RECORDERS

**LEFT TO RIGHT TRACE.** Most units feed the paper top to bottom as a convenience to the manufacturer. Graphs are read by either head bending or artificially training the eye. The 3000 Strips read naturally, whether in a rack, on the bench, flat, or standing on end.

**STATE OF THE ART CHART DRIVE.** Speed changes are reflected in instantaneous chart movement. Other recorders using gear shifters or transmissions have objectionable time lapses while backlash is overcome.

**PLUG-IN MODULES.** Most conventional strips are application limited by fixed ranges. Some do have very wide ranges and commensurate prices. The 3000 can be either and can be changed at any time with the inexpensive modules.

**CHART LOADING.** Simple and direct, there are no magazines to remove — no threading around, in, and behind bars.

**SNAP IN PENS, ELECTRIC PEN LIFT, AND EVENT MARKER** are standard. Most strips use complicated capillary pen systems and only offer electric lifts and event markers as options.

### FEATURES

**CHART:** 10 inch (or 25 cm) wide chart grid, 100 foot roll.

**NUMBER OF PENS:** One and two pen recorders plus event marker are available. Second pen in two pen recorder is offset 0.3 inches so both pens can traverse full 10 inch chart width. Y axis (both in 2–3000) and event pens are raised and lowered together.

**EVENT MARKER:** A single event marker is a standard feature of both one and two pen recorders. The event marker is actuated by pushbutton on time base module or external contact closure.

**DIGITAL CHART SPEED:** Nine pushbutton selected speeds. Instantaneous reaction as there are no gear transmissions, clutches or kinematic wonders.

**PAPER FEED:** Roll takeup or positive paper feed without modification.

houston  
instrument

DIVISION OF BARNES & LINDNER

OMNIGRAPHIC

Type 50

CHART SPEED - IN/MIN



OFF 20 10 5 2 1 5 2 1

## WORLD'S MOST VERSATILE STRIP CHART RECORDER

OMNIGRAPHIC® 3000 and 2-3000 one and two pen strip chart recorders are used in a greater variety of recording jobs than any other general purpose laboratory recorder in the world. Dozens are purchased by Original Equipment Manufacturers for installation in complex systems. Choice of signal modules adapts the single function mainframe to:

Precision D.C. Recording voltmeter with spans from .001 to 500 volts.

Log D.C. Recording voltmeter with 20, 40, 60 db dynamic range (10, 100, 1000:1 span limits).

A.C. Recording voltmeter; spans from .001 to 200 VAC; low audio through ultrasonic frequencies.

Thermocouple Recorder.

Strain Gage Recorder — Strain, force, pressure.

Point Plotter — Plot output from 1000 channel pulse height analyzer in less than 90 seconds.

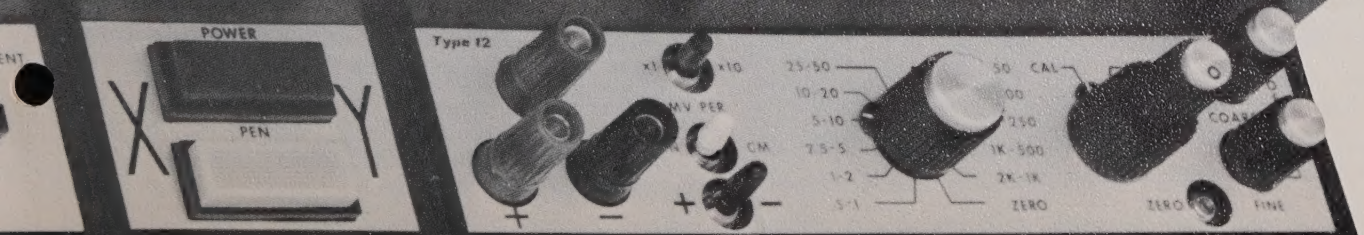
Gas Chromatograph Readout — Both GC output and amplitude — time integral recorder over full 10 inch chart width.

Chart Drive slaved to monochromator scan.

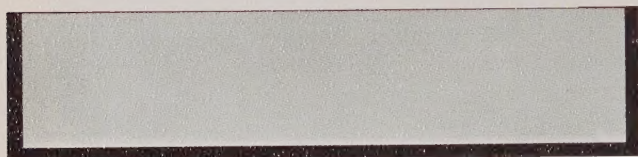
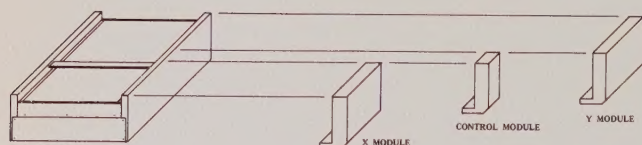
Chart Drive and pen controlled by limit switches for recording only out of limit conditions.

PHIC™

3000 RECORDER

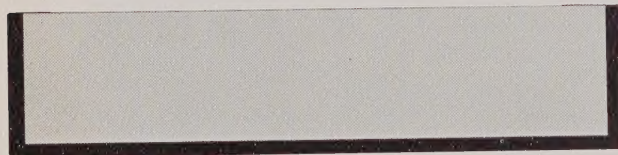


## SIGNAL MODULES



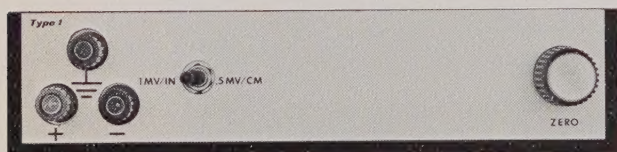
**TYPE 0 — CUSTOMIZING:** This module is ideal for specials. Comes complete with chassis, housing, blank front panel decal, mainframe connector and remote barrier strip. Precision resistors for amplifier scaling and IN — CM scaling are installed. For X and Y inputs to 2000 and Y input to 3000 (both Y channels in 2—3000).

**PRICE:** .....\$25.00



**TYPE 00 — CUSTOMIZING:** Blank module for chart axis drive in 3000 and 2—3000 recorders. Includes chassis, housing, mainframe connector, and remote barrier strip.

**Price:** .....\$25.00



**TYPE 1 — DC COUPLER:** A fixed sensitivity signal is fed via the input terminals directly into the recorder mainframe.

Front panel IN/CM scaling choice and zero control give operational flexibility. This module is predominantly for dedicated applications.

**Sensitivity:** One fixed DC Range of 1 mv/inch (0.5 mv/cm).

**Scaling:** IN/CM sw. for choice of sensitivity and paper grid.

**Input Resistance:** 1 megohm all conditions.

**Zero:**  $\pm 110\%$  of full scale with ten turn control; friction drag prevents inadvertent movement.

**Input:** Universal 5 way front panel terminal; parallel remote terminal on module bottom.

**Price:** .....\$60.00



**TYPE 2 — DC RANGING:** An inexpensive module for continuous, but non-calibrated, span adjustments.

**Sensitivity:** 1 mv/inch (0.5 mv/cm) continuously variable with non-calibrated ten turn control.

**Scaling:** IN/CM sw. for choice of sensitivity and paper grid.

**Input Resistance:** 100 K ohms. Fixed all conditions.

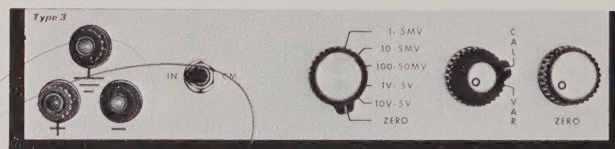
**Zero:**  $\pm 110\%$  of full scale with ten turn control; friction drag prevents inadvertent movement.

**Inputs:** Universal 5 way front panel terminals; parallel remote terminals on module bottom.

**Price:** .....\$75.00

**Option:** Type 2A includes 10 turn dial calibrated attenuator control.

**Price:** .....\$110.00



**TYPE 3 — DC SWITCHING:** Moderately priced, this flexible module is ideal for everyday use. Each of its five ranges is calibrated, accurate and ultra-stable.

**Sensitivity:** 5 ranges of 1, 10, 100 mv/inch; 1, 10 volt/inch AND 5 Metric ranges of 0.5, 5, 50 mv/cm; 0.5, 5 volt/cm. All ranges fixed, switch selectable and calibrated; between range variable control.

**Scaling:** IN/CM sw. for choice of sensitivity and paper grid.

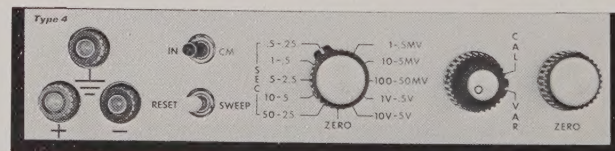
**Input Resistance:** 1 megohm. Fixed all conditions.

**Zero:**  $\pm 110\%$  of full scale with ten turn control; friction drag prevents inadvertent movement.

**Zero Check:** Verifies position and allows calibration of zero without disconnecting or shorting input signal.

**Inputs:** Universal 5 way front panel terminals; parallel remote terminals on module bottom.

**Price:** .....\$90.00



**TYPE 4 — DC SWITCHING/TIME BASE:** A perfect companion for the Type 3 Module. By flick of a switch the variable (X or Y) can be voltage attenuated or the axis driven according to time. Use on X or Y axis.

**Time Base Ranges:** 5 sweeps of 0.5, 1, 5, 10, 50 sec/inch AND 5 Metric sweeps of 0.25, 0.5, 2.5, 5, 25 sec/cm. All ranges fixed, switch selectable and calibrated; between range variable control.

**Price:** .....\$210.00



**TYPE 5 — DC PRECISION ATTENUATOR:** Fourteen calibrated ranges in a 1-2-5 switching sequence. Variable control gives between range span adjustments.

**Sensitivity:** 14 ranges of 1, 2, 5, 10, 20, 50, 100, 200 mv/inch; 0.5, 1, 2, 5, 10, 20 v/inch AND 14 Metric ranges of 0.5, 1, 2.5, 5, 10, 25, 50, 100, 250 mv/cm; 0.5, 1, 2.5, 5, 10 volt/cm. All ranges fixed, switch selectable, and calibrated; between range variable control.

**Scaling:** IN/CM sw. for choice of sensitivity and paper grid.

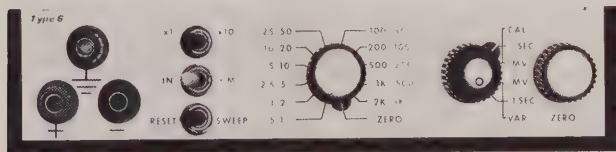
**Input Resistance:** 1 megohm. Fixed all conditions.

**Zero:**  $\pm 110\%$  of full scale with ten turn control; friction drag prevents inadvertent movement.

**Zero Check:** Verifies position and allows calibration of zero without disconnecting or shorting input signal.

**Inputs:** Universal 5 way front panel terminals; parallel remote terminals on module bottom.

**Price:** ..... \$170.00



**TYPE 6 — DC PRECISION ATTENUATOR/TIME BASE:** All features of the Type 5 Module plus voltage ranging or time base operation at the flip of a switch.

**Time Base Ranges:** 11 sweeps of 0.1, 0.2, 0.5, 1, 2, 5, 10, 20, 50, 100, 200 sec/inch AND 11 Metric sweeps of 0.05, 0.1, 0.25, 0.5, 1, 2.5, 5, 10, 25, 50 and 100 sec/cm. All ranges fixed, switch selectable, and calibrated; between range variable control.

**Price:** ..... \$280.00



**TYPE 9 — PRECISION RANGING:** Continuous calibrated scaling by means of a ten turn dial indicating attenuator. Zero control also features dial indication.

**Sensitivity:** 3 ranges of 1, 10, 100 mv/inch AND 3 Metric ranges of 0.5, 5, 50 mv/cm; each is fixed, calibrated, and switch selectable. Ten turn dial indicating range vernier allows precise and calibrated mid range setting.

**Scaling:** IN/CM sw. for choice of sensitivity and paper grid.

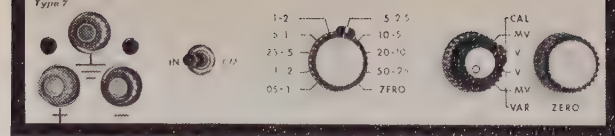
**Input Resistance:** 100 K ohm on 1 mv/inch. 1 megohm all other ranges. Fixed all conditions.

**Zero:** Ten turn zero has dial indication for precise setting.

**Zero Check:** Verifies position and allows calibration of zero without disconnecting or shorting input signal.

**Inputs:** Universal 5 way front panel terminals; parallel remote terminals on module bottom.

**Price:** ..... \$190.00



**TYPE 7 — DC PRE-AMPLIFIER:** Eighteen ranges from 100  $\mu$ volts per inch to 20 v/inch (and their Metric equivalents) give outstanding recording capabilities.

**Sensitivity:** 17 ranges from 0.1 millivolts to 20 volts per inch in 1-2-5 steps and 17 ranges from 0.05 millivolts to 10 volts per centimeter. All ranges fixed, switch selectable and calibrated; between range variable control.

**Scaling:** IN/CM sw. for choice of sensitivity and paper grid.

**Input Resistance:** Potentiometric all millivolt ranges. On volt ranges — 1 megohm. Fixed all conditions.

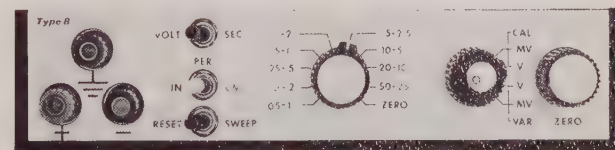
**Zero:**  $\pm 110\%$  of full scale with ten turn control; friction drag prevents inadvertent movement.

**Zero Check:** Verifies position and allows calibration of zero without disconnecting or shorting input signal.

**Zero Drift:** 1 microvolt/ $^{\circ}$ C after 5 minute warmup.

**Inputs:** Universal 5 way front panel terminals; parallel remote terminals on module bottom.

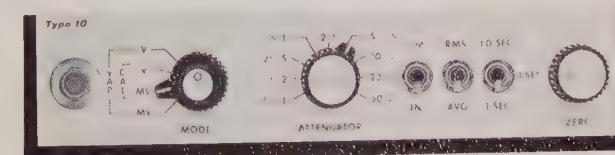
**Price:** ..... \$310.00



**TYPE 8 — DC PRE-AMPLIFIER/TIME BASE:** A combination of the high sensitivity Type 7 with a wide selection of time sweeps. It can be used for X or Y axes.

**Time Base Ranges:** 9 sweeps from 0.1 to 50 seconds per inch in 1-2-5 steps and 9 sweeps from 0.05 to 25 seconds per centimeter. All ranges fixed, switch selectable, and calibrated; between range variable control.

**Price:** ..... \$420.00



**TYPE 10 — HIGH SENSITIVITY AC CONVERTER:** High sensitivity of 100  $\mu$ volts/in, choice of filter time constants, and both Average and RMS scaling. SENSITIVITY, SCALING, ZERO, same as Type 7.

**Input Impedance:** AC coupled; 10 megohms on millivolt ranges, one megohm on volt ranges, paralleled with 100 picofarad.

**Type of Input:** Single ended, BNC connector, floating to 500 volts above or below chassis ground.

**Calibrated Accuracy:**  $\pm 0.25\%$  F.S., 50 Hz to 50K Hz, module and plotter combined.

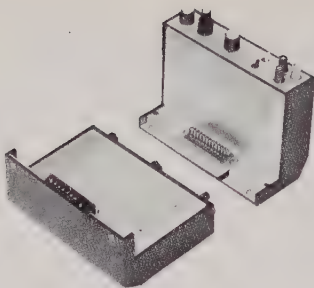
**Frequency Response:**  $\pm 0.1$  db, 20 Hz to 100K Hz.

**AC Offset:**  $< 50 \mu$ volt RMS, referred to input.

**Converter Time Constants:** 0.1, 0.4, 1.0 seconds.

**Scaling:** Average and RMS (scaled for sine wave).

**Price:** ..... \$495.00 11



**TYPE 11 — 1 MV FULL SCALE (10" or 250 mm):** Primary use is for gas chromatograph read-out.

**Sensitivity:** 1 mv full scale fixed. (10" or 250 mm).

**Scaling:** IN/CM sw. for choice of sensitivity and paper grid.

**Input Resistance:** Potentiometric.

**Zero:**  $\pm 110\%$  of full scale with ten turn control; friction drag prevents inadvertent movement.

**Inputs:** Universal 5 way front panel terminals; parallel remote terminals on module bottom.

**Price:** ..... \$135.00



**TYPE 12 — PRECISION ATTENUATOR/OFFSET:** Type 12 has 0–1 volt adjustable offset, also giving the fourteen multipurpose ranges of the Type 5 Module. Two controls give precise dial-in voltages of 0–1 volt (coarse) and 0 to 10 mv (fine). The conventional zero control is retained to preserve the identity of offset and zeroing.

**Sensitivity:** 14 ranges of 1, 2, 5, 10, 20, 50, 100, 200 mv/inch; 0.5, 1, 2, 5, 10, 20 v/inch AND 14 Metric ranges of 0.5, 1, 2.5, 5, 10, 25, 50, 100, 250 mv/cm; 0.5, 1, 2.5, 5, 10 volt/cm. All ranges fixed, switch selectable, and calibrated; between range variable control.

**Scaling:** IN/CM sw. for choice of sensitivity and paper grid.

**Input Resistance:** 1 megohm. Fixed all conditions.

**Zero Offset:** Coarse (0–1 volt) and fine (0–10 mv) ten turn controls with polarity switch.

**Zero Check:** Verifies position and allows calibration of zero offset without disconnecting or shorting input signal.

**Offset Polarity Sw.:** Determines offset polarity. Has center position for Zero Offset.

**Inputs:** Universal 5 way front panel terminals; parallel remote terminals on module bottom.

**Price:** ..... \$300.00



**TYPE 15 — TWO CHANNEL DC SWITCHING:** An economical way to record two data signals in a single recording channel. Attenuators and zero controls are independent, the inputs may even be of opposite polarities. Basic specifications for each channel same as Type 3 except as noted.

**Input Resistance:** One megohm on calibrated ranges; greater than 500K ohms uncalibrated.

**Conformity:** The sensitivities of the two channels differ by less than 0.1% at each of the five calibrated attenuator settings.

**Input:** Signal high, low, and ground are connected to a barrier strip at the rear of the module.

**Channel Selection:** Channel 1, channel 2, or both channels alternately.

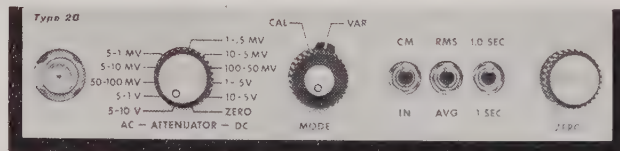
**Pen Control:** Point: Pen is momentarily lowered at selected rate, resulting in a succession of points.

Line: Pen is alternately raised and lowered at selected rate, resulting in a succession of discontinuous line segments.

Duty Cycle: Dwell (marking) time of channel 1 can be set to 1X, 2X, or 3X that of channel 2.

**Sampling Rate:** Adjustable from 3 to 40 pairs of points in multiplex mode, 6 to 80 points in single channel mode, per minute.

**Price:** ..... \$545.00



**TYPE 20 — AC and DC SWITCHING MODULE:** Type 20 features the DC SENSITIVITY, SCALING, and ZERO of Type 3 plus the following AC characteristics:

**Input Impedance:** DC: One megohm, all conditions. AC: AC coupled, one megohm shunted by 100 picofarads, all conditions.

**Type of Input:** Single ended, BNC connector, floating to 500 volts above and below chassis ground.

**Calibrated Accuracy:** DC:  $\pm 0.2\%$  of full scale, module and recorder combined. AC:  $\pm 0.25\%$  of full scale, module and plotter. (VAR MODE — D.C. only).

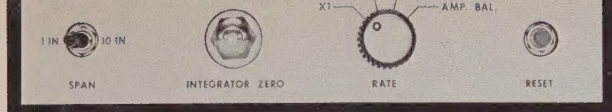
**Frequency Response:** (AC only)  $\pm 0.1$  db, 20 Hz to 100K Hz.

**AC Offset:**  $< 50\mu$ volts RMS, referred to input.

**Converter Time Constants:** 0.1 and 1.0 seconds.

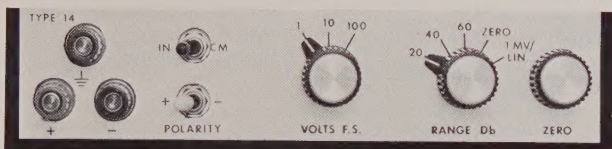
**Scaling:** Average and RMS (scaled for sine wave).

**Price:** ..... \$495.00



**TYPE 13 – INTEGRATOR:** Specifically intended for use in OMNIGRAPHIC® 3000 strip chart. Type 13 is installed in the Y2 connector, requires no external wiring. A voltage proportional to the deflection of the Y1 pen from chart zero is integrated causing the Y2 pen to be deflected at a corresponding rate. Ten inches (or 1 inch if desired) traverse. Rate of integration can be increased X2 and X5 by front panel switch.

**Price:** ..... \$475.00



**TYPE 14 – DC LOG CONVERTER:** For DC recording where resolution and dynamic range are of equal concern.

**Full Scale Voltage:** 1, 10, 100 volts.

**Dynamic Range:** 20, 40, 60 db (1, 2, 3 decades).

**Conversion Accuracy:**  $\pm 0.2\%$  of range (in db).

**Input Resistance:** One megohm.

**Input:** Universal 5 way front panel terminals; parallel remote terminals on module bottom.

**Price:** ..... \$400.00



**TYPE 16/17 – POINT PLOTTER:** Chart and pen axis modules used with OMNIGRAPHIC® 3000 strip chart recorder for point plot readout of digital to analog converters in multi-channel pulse height analyzers, digital computers, and similar source of successive discrete data points.

#### Chart Axis:

**Resolution:** .025, .050, .075, .100 inches chart advance per plot.

**Plot Advance Rate:** 12 points/second max.

#### Pen Axis:

**Sensitivity:** 1, 10, 100 millivolts 1 and 10 volts per inch; 0.5, 5, 50 millivolts, 0.5 and 5 volts per centimeter; continuously variable vernier between ranges.

**Input Resistance:** One megohm constant, all conditions.

**Zero:**  $\pm 110\%$  of full scale referred to chart zero.

#### Interface:

**Seek Command:** +3 to +12 volts or -3 to -12 volts; 0.3  $\mu$ sec/volt rise time, maximum; 2  $\mu$ sec. duration, minimum.

**Completed Plot Command:** Variable from zero to +18 or -18 volts; 0.2  $\mu$ sec/volt rise time minimum; 15 milliseconds duration.

**Disable Command:** +3 to +12 or -3 to -12 volts.

**Price:** ..... \$960.00

## ON THIS PAGE SPECIAL PURPOSE MODULES



**TYPE 18 – UNIVERSAL THERMOCOUPLE REFERENCE:** Terminates any ISA thermocouple; continuously variable span and offset controls permit recording any 10 to 60 millivolt portion of input over full 10 inch chart span.

**Thermocouple Types:** Serves as reference junction for types J, K, T, E, R, and S by selection of electrical connections inside module.

**Reference Temperature:** 0°C.

**Reference Junction Tracking Accuracy:**  $\pm 0.75^\circ\text{C}$ .

**Span:** Continuously adjustable from 10–60 millivolts. Ten turn control with 1000 count dial and lock.

**Offset:** 50 millivolts, continuous ten turn control with 1000 count dial and lock.

**Price:** ..... \$250.00



**TYPE 26/17 – POINT PLOTTER:** Chart (X) and pen (Y) axis point plotter modules for OMNIGRAPHIC® 2000. In addition to scaling X and Y input signals, these modules include Y axis null detector and logic to accept and generate synchronizing and pen up/down controls. Cables are available for connecting the Point Plotter to most multi-channel pulse height analyzers.

#### Data Inputs:

**Sensitivity:** X and Y axes: 1, 10, 100 millivolts, 1 and 10 volts/inch; 0.5, 5, 50 millivolts, 0.5 and 5 volt/centimeter. Continuously variable vernier between adjacent ranges.

**Input Resistance:** One megohm constant, all conditions.

**Zero:**  $\pm 110\%$  of full scale referred to chart zero.

#### Interface:

**Seek Command:** +3 to +12 volts or -3 to -12 volts; 0.3  $\mu$ sec/volt rise time, maximum; 2  $\mu$ sec. duration, minimum.

**Completed Plot Command:** Variable from zero to +18 or -18 volts; 0.2  $\mu$ sec/volt rise time minimum; 15 milliseconds duration.

**Disable Command:** +3 to +12 or -3 to -12 volts.

#### Plotting Characteristics:

**Plot Modes:** Calibrate, Point, Line, X-Y, Standby.

**Plot Rate:** 600 points per minute average, 720 points per minute maximum.

**Price:** ..... \$960.00

## O.E.M. RECORDERS

Variations of the basic OMNIGRAPHIC® 2000 X-Y and 3000 Strip Chart recorders can result in substantial savings in cost and complexity for O.E.M. and other quantity purchasers. Consult Houston Instrument or its representative for detailed information concerning any of the following recorders.

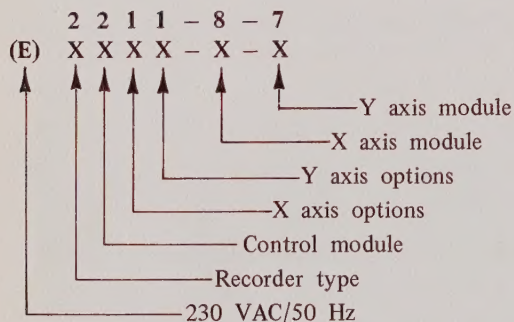
**OMNIGRAPHIC® 3090 and 2-3090:** The variable speed stepper motor used in 3000 and 2-3000 Strip Chart recorders is replaced by a single speed synchronous chart

drive motor. The other features of these recorders unaffected.

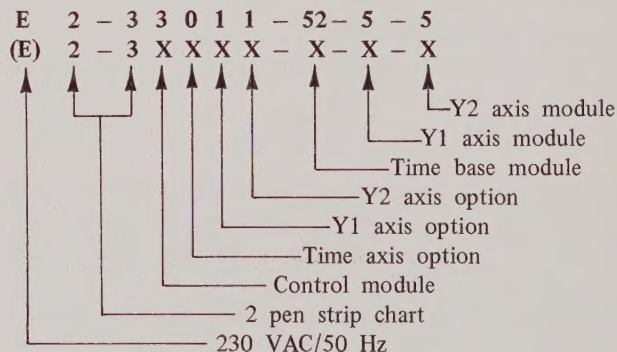
**OMNIGRAPHIC® 4000 and 4090:** The X axis servo system of the 2000 X-Y recorder is replaced by a stepper motor drive in the 4000 T-Y® recorder and by a single speed synchronous drive motor in 4090 T-Y® recorders. The Y axis characteristics and other features of the 2000 X-Y recorder are unaffected. These recorders combine the time base of the strip chart recorders and the compact format of the X-Y charts.

## MODEL IDENTIFICATION

### 2000 X-Y 3000 STRIP CHART



### 2-3000 TWO PEN STRIP CHART



## RECORDER OPTIONS

| DESIGNATOR | DESCRIPTION                                       |                               | PRICE           |
|------------|---------------------------------------------------|-------------------------------|-----------------|
| 1          | High speed servo: > 40 in/sec                     | 2000 (both axes only)         | \$200.00        |
|            |                                                   | 3000 and 2-3000 (Y axis only) | 100.00 per axis |
| 2          | Retransmitting Potentiometer                      | 2000                          | 50.00 per axis  |
|            |                                                   | 3000 and 2-3000 (Y axis only) | 50.00 per axis  |
| 3          | High Speed Servo and Retransmitting Potentiometer | 2000 (both axes only)         | 300.00          |
|            |                                                   | 3000 and 2-3000 (Y axis only) | 150.00 per axis |
| 4          | High-Low Limit Switches                           | 2000                          | 75.00 per axis  |
|            |                                                   | 3000 and 2-3000 (Y axis only) | 75.00 per axis  |
| 5          | Special Increment Size                            | 3000 and 2-3000 (X axis only) | Factory Quote   |

## IN ORDERING PLEASE SPECIFY

1. Recorder Model No., ie 2000 X-Y, 3000 Strip Chart
2. Control Module Type
3. X Axis Module Type
4. Y Axis (Y1 & Y2 in 2-3000) Modules
5. X Axis Options
6. Y (Y1 and Y2 in 2-3000) Options
7. 230 VAC/50 Hz Operation

## RECORDING SUPPLIES

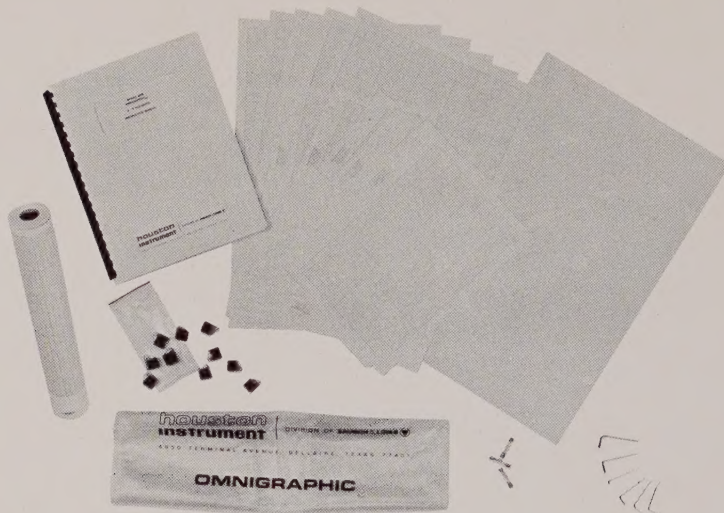
### CHART PAPER

Popular papers are listed. Specify heavy or light weight when ordering.

| CAT. NO. | DESCRIPTION                                                                                        | PRICE/100         |
|----------|----------------------------------------------------------------------------------------------------|-------------------|
| 101512   | 11 x 16½ with 10 x 12 major divisions                                                              | \$6.00            |
| 101515   | 11 x 16½ with 1 inch square major grid                                                             | 6.00              |
| 101538   | 11 x 16½ with 1 cm square major grid                                                               | 6.00              |
| 34504    | 8½ x 11 with 1 inch square major division                                                          | 5.00              |
| 81012    | 8½ x 11 with 10 x 12 major divisions                                                               | 5.00              |
| 81015    | 8½ x 11 with 10 x 15 major divisions                                                               | 5.00              |
|          |                                                                                                    | <b>PRICE/Roll</b> |
| RC-109   | Y axis 10 major divisions in inches<br>X axis 100 foot long, 1 inch major divisions                | \$3.90            |
| RC-110   | Y axis 25 cm (1 cm/major division)<br>X axis 100 foot long, 1 inch major divisions                 | 3.90              |
| RC-129   | Y axis 25 cm; 2.5 cm/major divisions<br>X axis 1 cm major, 0.2 cm minor divisions 30.5 meters long | 3.90              |
| RC-115   | Blank Roll 12 inches x 100 foot long                                                               | 3.50              |

### PENS

| CAT. NO. | DESCRIPTION                  | PACKET PRICE |
|----------|------------------------------|--------------|
| P-40     | Packet 10 pens - red         | \$12.00      |
| P-41     | Packet 10 pens - blue        | 12.00        |
| P-42     | Packet 10 pens - green       | 12.00        |
| P-43     | Packet 10 pens - black       | 12.00        |
| P-52     | Packet 10 pens - black & red | 12.00        |



## STANDARD ACCESSORIES SUPPLIED

- Instruction Manual
- Dust Cover — Flexible
- Sample Graph Paper (10 sheets) (2000)
- Roll Chart Paper (3000)
- Accessory Kit containing:
  - 5 Red Pens
  - 5 Black Pens
  - 3 Fuses
  - Set Bristol Wrenches
  - 8½ X 11 (or A4) Shield (2000)

### Warranty

Houston Instrument warrants unconditionally for 1 year from date of shipment each instrument manufactured by it to be free from defects in material and workmanship. Its liability under this warranty is limited to servicing or adjusting any instrument returned by the original purchaser to the factory for that purpose and to replace any defective parts therein.

### REPRESENTED BY

**houston**  
**instrument**

DIVISION OF BAUSCH & LOMB 

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